



Strengthening breast cancer imaging with PET/CT

Every breast cancer tells a different biological story, and Istanbul Training and Research Hospital's next generation PET/CT is helping clinicians understand the disease more clearly. The scanner is helping to evaluate emerging radiopharmaceuticals to advance the role of molecular imaging in precision breast cancer care.

By Tanja Kellner-Reinhold | Photos and data courtesy of Istanbul Training and Research Hospital, Türkiye.

For Prof. Dr. Esra Arslan and her nuclear medicine team at Istanbul Training and Research Hospital in Türkiye, PET/CT is more than a diagnostic tool—it is also a platform for addressing some of the most challenging questions in breast cancer imaging. Arslan reflects upon a common scenario, “A patient with recurrent breast cancer had equivocal findings on conventional imaging, but PET/CT clearly demonstrated the extent of the disease, allowing the multidisciplinary team to adjust systemic treatment and avoid unnecessary procedures.”

One of Türkiye’s largest tertiary referral academic centers, Istanbul Training and Research Hospital combines high-volume clinical care with medical education and translational research. Led by Arslan, the Department of Nuclear Medicine integrates PET/CT into daily clinical practice to support staging, detect recurrence, and assess treatment response in patients with breast cancer. Beyond improving lesion detectability, it is particularly valuable for identifying abnormal metabolic activity, for example, in axillary lymph nodes, where increased uptake may indicate regional disease spread and directly influence treatment planning.

By providing detailed information on tumor biology and disease

distribution, PET/CT supports clinical decision-making across multiple specialties. Arslan’s nuclear medicine team brings together associate professors, nuclear medicine physicians, physicists, radiopharmacists, technologists, nurses, and research staff. They collaborate closely with these colleagues to ensure that imaging, image analysis, radiopharmaceutical expertise, and clinical interpretation are fully integrated to support personalized patient management.

Applying advanced PET/CT imaging technology

Many of the department’s research projects have been enabled by their next-generation Biograph Trinion PET/CT scanner, installed in July 2025. The system combines high sensitivity with ultra-fast time-of-flight (TOF)^a performance, AI-powered workflow tools, and compatibility with established and emerging radiopharmaceuticals, enabling high-quality imaging in both routine clinical practice and research protocols, all helping to address the hospital’s increasing patient volumes and the growing complexity of oncologic imaging. “Biograph Trinion’s high sensitivity and excellent timing resolution allow us to visualize subtle uptake patterns and maximize the value of novel tracers, particularly when imaging low-expression

targets,” says Arslan. “We were particularly impressed by the combination of image quality and operational efficiency.”

Since installation, the team routinely scans 45 to 50 patients per day, depending on tracer availability and imaging protocols, according to Arslan. High sensitivity, rapid acquisitions, streamlined image reconstruction, and AI-powered patient positioning have all contributed to improved workflow efficiency, while the intuitive user interface enabled technologists to adapt quickly with minimal training.

Addressing unanswered questions in breast cancer imaging

Alongside routine imaging with fludeoxyglucose injection F 18 (FDG), the group is evaluating emerging radiopharmaceuticals, such as ⁶⁸Ga-FAPI and prostate-specific membrane antigen (PSMA)-targeted tracers, to investigate how they can complement conventional imaging and provide additional insights into tumor biology.

While FDG remains the most widely used tracer, Arslan and her team are actively exploring a growing portfolio of radiopharmaceuticals that provide insights beyond glucose metabolism. Many of their research projects focus

Istanbul Training and Research Hospital, Türkiye.





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on unmet clinical needs in breast cancer imaging. Questions include: What can be done for breast cancer patients with low FDG-avid tumors? How to identify new imaging and treatment opportunities for triple-negative breast cancer? And how can PET/CT imaging contribute to the assessment of brain metastases?

Emerging tracers for individualized treatment for breast cancer

"Molecular imaging is rapidly evolving beyond FDG. We are particularly interested in emerging tracers such as fibroblast activation protein inhibitor (FAPI), fluorine-18 fluoroestradiol (FES), integrin-targeted tracers, PSMA, gastrin-releasing peptide receptor (GRPR) targeted tracers, and DPI-4452 for renal cell carcinoma," she says. "Each provides different biological insights—from receptor expression and hormone sensitivity to angiogenesis and the tumor microenvironment—helping us move toward more precise and individualized treatment approaches."

One research focus of Arslan is imaging breast cancers that show low FDG

uptake. Because such tumors can be difficult to visualize with standard FDG PET/CT, she and her colleagues have investigated whether FAPI tracers, which bind to fibroblast activation protein expressed by cancer-associated fibroblasts in the tumor microenvironment, can improve lesion detection in this patient population.

In a 2023 comparative study of 24 patients with low-FDG-avid breast tumors, Arslan and colleagues compared ^{68}Ga -FAPI-04 PET/CT with conventional FDG PET/CT. The findings suggest higher diagnostic sensitivity and more accurate lymph node staging with ^{68}Ga -FAPI-04 PET/CT in this cohort, indicating that FAPI may complement conventional imaging when FDG uptake is limited.¹

The group's research has also highlighted the potential value of FAPI imaging in unusual clinical scenarios. In a 2024 case report, ^{68}Ga -FAPI-46 PET/CT successfully detected a rare gastric metastasis from invasive lobular breast cancer that was not clearly visualized with conventional FDG PET/CT. The case illustrates the potential value of FAPI

imaging in selected patients with low-FDG-avid disease.²

PSMA-targeted imaging for breast and other cancers

Another important research focus is triple-negative breast cancer (TNBC), one of the most aggressive breast cancer subtypes that does not respond to hormone therapy. In a 2023 prospective study comparing ^{68}Ga -PSMA PET/CT and FDG PET/CT, the researchers found that FDG PET/CT remained the more sensitive modality for detecting primary tumors and lymph node metastases. However, PSMA expression was identified in a subset of tumors. These findings support continued investigation of PSMA-targeted imaging and its potential role in future theranostic strategies for selected breast cancer patients.³

Arslan and her team have also explored PET/CT imaging in patients with brain metastases from breast cancer and other malignancies. "FDG PET/CT is limited in the brain as it has a high glucose uptake, which can mask lesions," she explains. "PSMA PET has shown promise in detecting brain metastases with high sensitivity." The team observed lesion detection that was comparable to MRI, with PET/CT visualizing metastatic lesions measuring approximately 2.1 mm.⁴ "That was very exciting for us," adds Arslan. "MRI remains the gold standard for brain metastases, but molecular imaging may provide additional biologic information that could influence patient management. If we can identify target expression, we may also open the door to future theranostic treatment options."

Supporting clinical practice and future innovation

Alongside breast cancer imaging, the department performs a broad range of molecular imaging studies using FDG,



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PSMA, DOTATATE, FAPI, and investigational gastrinreleasing peptide receptors (GRPR) across multiple cancer types as well as neurological indications such as dementia.⁵

As new radiopharmaceuticals continue to emerge, the combination of Biograph Trinion PET/CT technology and translational research enables Arslan and her team to evaluate promising imaging biomarkers while expanding the role of molecular imaging in precision oncology. Their work in breast cancer illustrates how clinical practice and research can complement one another, bringing

innovative imaging approaches closer to everyday patient care. ●

^a Ultra-fast time of flight (TOF) is defined as less than 275 picoseconds (ps). Data on file.

The Biograph Trinion PET/CT platform is not available in all countries. Future availability cannot be guaranteed.

The statements by Siemens Healthineers customers described herein are based on results that were achieved in the customer's unique setting. Because there is no “typical” hospital or laboratory and many variables exist (eg, hospital size, sample mix, case mix, level of IT, and/or automation adoption), there can be no guarantee that other customers will achieve the same results.

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